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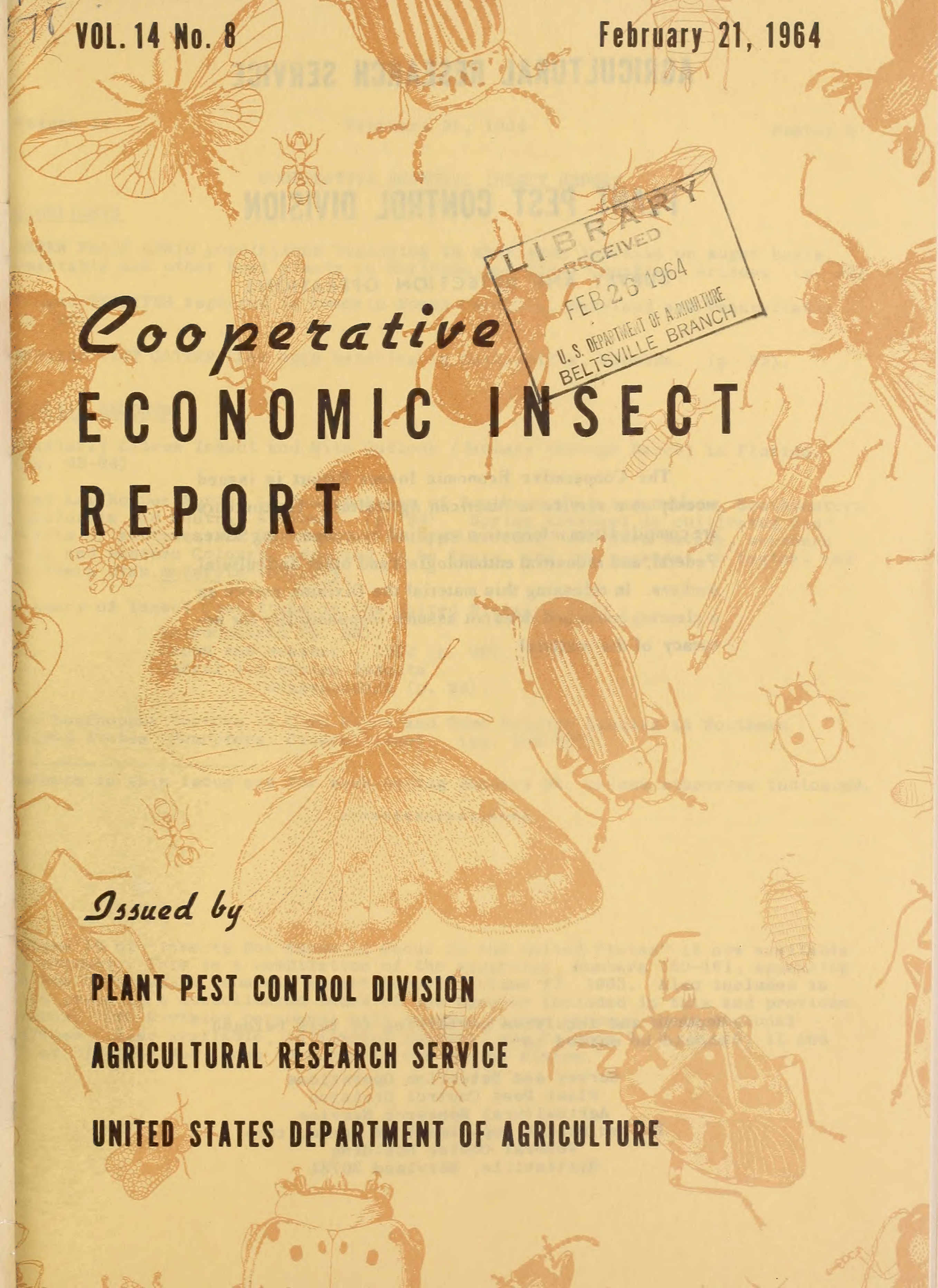

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Cooperative ECONOMIC INSECT REPORT

Issued by

PLANT PEST CONTROL DIVISION

AGRICULTURAL RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

PLANT PEST CONTROL DIVISION

SURVEY AND DETECTION OPERATIONS

The Cooperative Economic Insect Report is issued weekly as a service to American Agriculture. Its contents are compiled from information supplied by cooperating State, Federal, and industrial entomologists and other agricultural workers. In releasing this material the Division serves as a clearing house and does not assume responsibility for accuracy of the material.

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Hyattsville, Maryland 20781

Volume 14 February 21, 1964 Number 8

COOPERATIVE ECONOMIC INSECT REPORT

HIGHLIGHTS

GREEN PEACH APHID populations beginning to show some increase on sugar beets, vegetable and other host plants in Maricopa and Pinal Counties, Arizona. (p. 94).

Winged TERMITES reported in homes in North Carolina, Maryland and Pennsylvania (p. 96).

EASTERN TENT CATERPILLAR eggs hatching in Gainesville, Florida. (p. 95).

SPECIAL REPORTS

Quarterly Citrus Insect and Mite Outlook (January through March) in Florida. (pp. 93-94).

Beet Leafhopper Survey in Desert Areas of Southern Utah and Nevada, Southwestern California and Central Arizona. (p. 94). Spring movement to cultivated districts of southwestern California, central Arizona, southern Nevada, southern Utah and western Colorado expected to be heavy, and the movement to central and northern Utah moderate to heavy.

Summary of Insect Conditions in the United States - 1963
    Introduction (p. 98).
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The Leafhopper Vectors of Corn Stunt and Some Related Species in Southern United States (Homoptera: Cicadellidae). (pp. 105-106).

Reports in this issue are for week ending January 31, unless otherwise indicated.

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Volume 13 of "Insects Not Known to Occur in the United States" is now available on request. This is a compilation of the separates, numbers 150-161, appearing in the Cooperative Economic Insect Report, Volume 13, 1963. Also included in this issue is a consolidated index of the species included in this and previous issues. PPC Division personnel will receive copies through their Regional Offices. Also available, in limited numbers, are Volumes 7, 8, 9, 10, 11 and 12 of "Insects Not Known to Occur in the United States."

WEATHER BUREAU'S 30-DAY OUTLOOK

MID-FEBRUARY TO MID-MARCH 1964

The Weather Bureau's 30-day outlook for the period from mid-February to mid-March calls for temperatures to average above seasonal normals in the northeast quadrant of the Nation. Below normal averages are predicted in States bordering the Gulf of Mexico and also in the western half of the Nation, except for near to above normal in the Northern Plains. For areas not specified near normal temperatures are in prospect. Precipitation is expected to be greater than normal in a broad band extending from New England through the Ohio Valley and Southern Plains into the Southern Rockies and Plateau. Subnormal amounts are indicated for the Pacific Northwest and Northern Plains, with near normal precipitation in unspecified areas.

Weather forecast given here is based on the official 30-day "Resume and Outlook" published twice a month by the Weather Bureau. You can subscribe through the Superintendent of Documents, Washington, D. C. 20250. Price $4.80 a year, $2.40 a half year.

WEATHER OF THE WEEK ENDING FEBRUARY 10

Arctic air poured into the northern Great Plains and Great Lakes region on Monday, February 10. The temperature at National Falls, Minnesota, dropped to 22° below zero. Several inches of snow fell over parts of Missouri and eastward to the middle Atlantic coast. At midweek, a storm in the Pacific northwest brought generous rains to western Washington and Oregon and, as the storm moved inland, snow fell in the higher elevations of those States and eastward to the Rocky Mountains. Meanwhile, a front which streached from north to south across the middle of the Nation, moved eastward causing snow over the middle and northern States and rain over the South. Snow falls of 5 inches or more were common from Missouri eastward and northeastward through the Great Lakes region, the Ohio River Valley and the north and middle Atlantic States. Rains fell from eastern Texas and Oklahoma to the south Atlantic coast. As the weekend approached, snow was falling over the northern Rocky Mountains. Fair weather prevailed over the Great Plains area, precipitation was diminishing and skies were clearing along the Atlantic seaboard. A new storm was developing over the southern Rocky Mountains. By Saturday the storm was producing heavy snow over Nebraska, Kansas, and eastward to Ohio, clogging highways over a 7-State area. Snow accumulated to 8 inches in central Missouri. The snow was accompanied by strong winds in Nebraska and Kansas. Sleet and freezing rain along the southern edge of this area made highway travel hazardous. The fast-moving storm reached New England by Sunday and produced 12 to 18 inches of snow at some inland localities in eastern Massachusetts. Temperatures averaged above normal over the northern Great Plains and below normal over most of the rest of the region. Temperature departures ranged from -8° at Huntington, West Virginia, and -10° at Pocatello, Idaho, to +17° over northeast Montana. Rainfall exceeded 1.00 inch in the extreme Northwest, over north central Missouri, Arkansas and eastward to the North Carolina coast and from Kentucky northeastward to New Jersey. Large areas from the Pacific Ocean to the Great Plains and Great Lakes region and northern New England received less than 0.50 inch. (Summary supplied by U.S. Weather Bureau).

CEREAL AND FORAGE INSECTS

ARMY CUTWORM (Chorizagrotis auxiliaris) - OKLAHOMA - Counts ranged 0.5-1.0 per linear foot in wheat checked in Hennessey area of Kingfisher County. (Okla. Coop. Sur.).

SOUTHWESTERN CORN BORER (Zeadiatraea grandiosella) - ARKANSAS - Surveys show winter survival 20 percent in Bradley County (southeast) and 16 percent in Washington County (northwest) to February 15. (Ark. Ins. Sur.).

AN ALFALFA WEEVIL (Hypera brunneipennis) - ARIZONA - Egg counts moderate to light on alfalfa in Maricopa County. Only an occasional larva has been found. No damage occurred during past week. (Ariz. Coop. Sur.).

LYGUS BUGS (Lygus spp.) - ARIZONA - Adults slowly increasing on alfalfa in Maricopa and Pinal Counties; averaged 16 per 100 sweeps. (Ariz. Coop. Sur.).

PEA APHID (Acyrthosiphon pisum) - NEW MEXICO - Spotted, light infestations continue present in Dona Ana, Chaves, Eddy and Sierra County alfalfa. (N. M. Coop. Rpt.). OKLAHOMA - Checks remain negative in Choctaw County, southeast area. (Okla. Coop. Sur.).

SPOTTED ALFALFA APHID (Therioaphis maculata) - ARIZONA - No increase found in alfalfa in Maricopa County; cool weather preventing rapid population increases. (Ariz. Coop. Sur.). OKLAHOMA - Light on overwintering alfalfa in Choctaw County, southeast area. (Okla. Coop. Sur.). ARKANSAS - Surveys continue negative in northwest area. (Ark. Ins. Sur.).

GREENBUG (Schizaphis graminum) - OKLAHOMA - Populations continue generally low throughout State; counts 2-8 per linear foot (one field up to 30) in Garfield County, northwest, 2-15 per foot in Kingfisher County, central, 6 per foot in Jefferson County, south central, and fewer than 10 per foot in Perkins area of Payne County, north central. (Okla. Coop. Sur.). ARKANSAS - Surveys continue negative in northwest area. (Ark. Ins. Sur.).

APPLE GRAIN APHID (Rhopalosiphum fitchii) - OKLAHOMA - Light counts of 3-10 per linear foot in Garfield County and 2-10 per foot in Kingfisher County. (Okla. Coop. Sur.).

CORN LEAF APHID (Rhopalosiphum maidis) - OKLAHOMA - Counts light; ranged 2-15 per linear foot in wheat fields checked in Garfield and Kingfisher Counties. (Okla. Coop. Sur.).

ENGLISH GRAIN APHID (Macrosiphum avenae) - OKLAHOMA - Light infestations of 6 per linear foot noted in Jefferson County wheat. (Okla. Coop. Sur.). ARKANSAS - Surveys continue negative in northwest area. (Ark. Ins. Sur.).

FRUIT INSECTS

Quarterly Citrus Insect and Mite Outlook (January through March) in Florida. This outlook is based on the assumption that weather beyond the period of the current U.S.W.B. 30-day outlook will be normal. Therefore, the forecasts given below cannot be viewed with the same degree of confidence as those in the "Citrus Insect Situation in Florida" published twice a month in this report. Each pest has more or less regular periods of increase and decrease throughout the year. Weather conditions (temperature, rain, humidity) may affect populations directly or indirectly through effects on predators, parasites and tree growth. Departures from the average population level may be caused by conditions that occurred months before. Other fluctuations may reflect recent weather changes. The latter influences can be forecast only to the extent that weather forecasts are available.

CITRUS RUST MITE (Phyllocoptruta oleivora) populations will be below the moderate level, typical of this period. Infestations will be important in about 33 percent of groves; a majority of these will be groves still showing cold damage. CITRUS RED MITE (Panonychus citri) and TEXAS CITRUS MITE (Eutetranychus banksi) infestations will be important only in a few scattered places until March when one or the other of these species will develop heavy populations in about 25 percent of groves. SIX-SPOTTED MITE (Eotetranychus sexmaculatus) is expected to be less prevalent than usual and of little concern. GLOVER SCALE (Lepidosaphes gloverii), CHAFF SCALE (Parlatoria pergandii) and YELLOW SCALE (Aonidiella citrina) will remain above normal abundance during the period. Gradual increase will occur, but few infestations will become important until after March. APHIDS will appear on new flush in late February. Infestations will be heavier on groves still recovering from the 1962 cold. WHITEFLIES will be above normal numbers despite a decrease expected in late February. (W. A. Simanton (Citrus Expt. Sta., Lake Alfred)).

CITRUS RED MITE (Panonychus citri) - FLORIDA - Severely infesting leaves of Citrus sp. at San Antonia, Pasco County, on February 2. (Barber, Williams).

A LEAF ROLLER (Platynota stultana) - ARIZONA - Larvae continue to cause some damage to young citrus trees in Mesa area of Maricopa County. (Ariz. Coop. Sur.).

WOOLLY APPLE APHID (Eriosoma lanigerum) - ALABAMA - Heavy infestations found on roots of some young apple trees in Coosa County; heaviest infestations in one young untreated orchard. (Sessions).

TRUCK CROP INSECTS

Beet Leafhopper Survey in Desert Areas of Southern Utah and Nevada, Southwestern California and Central Arizona. Surveys were conducted for beet leafhopper (Circulifer tenellus) during the period January 27 to February 8. Spring movement from the desert breeding grounds to cultivated districts of southwestern California, central Arizona, southern Nevada, southern Utah and western Colorado is expected to be heavy, and the movement to central and northern Utah moderate to heavy if favorable conditions prevail. The southern desert breeding grounds, comprising approximately 50,000 square miles of potential weed host area, were favored with extensive fall rains resulting in widespread host development on an estimated 36,350 square miles. However, scant winter rainfall caused stress on host plants in a few areas. This was especially noticeable south of the 34th parallel. Host plants were found at 70.3 percent of the 10-mile interval sampling points. The average number of beet leafhoppers found in areas where host plants were present was 0.15 per square foot. This report covers only the beet leafhopper situation as found in the area surveyed. It does not have reference to populations that may have overwintered in local breeding areas in northern and eastern Utah and in western Colorado and Nevada. (PPC, West. Reg.).

POPLAR PETIOLE GALL APHID (Pemphigus populitransversus) - TEXAS - Light to heavy populations damaging cabbage in Hidalgo County. (Tex. Coop. Rpt.; Meisch).

GREEN PEACH APHID (Myzus persicae) - ARIZONA - Populations beginning to show some increase on sugar beets, vegetable and other host plants in Maricopa and Pinal Counties. (Ariz. Coop. Sur.).

CABBAGE LOOPER (Trichoplusia ni) - FLORIDA - Lightly damaged 5 percent of 200 inspected cabbage plants at Sanford, Seminole County. (Desin).

A LEAF MINER - (Liriomyza sp.) - FLORIDA - Damage light on 32 percent of 200 celery plants at Sanford, Seminole County. Most leaf miners very small. Recent rains probably caused decrease in adult populations. Overall appearance of crop good. (Desin).

A WEEVIL (*Hyperodes texana*) - TEXAS - Of 16 carrot fields examined in an area bounded by highways 281 and 107 from La Feria in Cameron County to La Joya in Hidalgo County, 12 found to be infested with this species. One field had 50 percent of plants damaged and others ranged downward from this level. In general, only larger carrots damaged. (Tex. Coop. Rpt.).

FOREST, ORNAMENTAL AND SHADE TREE INSECTS

EASTERN TENT CATERPILLAR (*Malacosoma americanum*) - FLORIDA - Eggs hatching locally on wild cherry and wild plum at Gainesville, Alachua County, on February 7. (Hetrick).

DOGWOOD CLUB-GALL MIDGE (*Mycodiplosis alternata*) - ALABAMA - Examinations of galls on dogwoods in Etowah, Lee, Tallapoosa and Cherokee Counties shows this midge in pupal stage and awaiting proper temperature for emergence. Heaviest infestations found in mixed stand of hardwood pine and dogwood intermixed. Single or sparsely placed ornamental dogwood plantings on lawns and roadsides only very lightly infested. (McQueen).

SPIREA APHID (*Aphis spiraecola*) - ALABAMA - Eggs clustered on branches 10-25 percent hatched in Lee, Etowah and Cherokee Counties. Numerous first and second instars feeding on swollen buds, leaflets and early blossoms. Heaviest infestations appearing on Reaves spirea. (McQueen).

PINE BARK APHID (*Pineus strobi*) - MARYLAND - Heavy on 2 white pines at Lanham, Prince Georges County. (U. Md., Ent. Dept.).

A MAGNOLIA SCALE (*Phenacaspis cockerelli*) - FLORIDA - Severely infesting leaves of southern magnolia (*Magnolia grandiflora*) at Daytona Beach, Volusia County. (Pott, Feb. 3).

CAMELLIA SCALE (*Lepidosaphes camelliae*) - TEXAS - Moderate, widespread infestations reported from camellias in Montgomery County. (McCoy).

BOXELDER BUG (*Leptocoris trivittatus*) - TEXAS - Heavy, localized infestations reported from boxelder trees in Eastland County. (Cooper).

AN ANNUAL CICADA (*Tibicen* sp.) - ALABAMA - Second and third-stage nymphs found lightly feeding on tubers of dahlia in Lee County garden; damage to tubers apparently not serious. Nymphs 1-5 per dahlia hill. (McQueen).

SPRUCE SPIDER MITE (*Oligonychus ununguis*) - MARYLAND - Eggs numerous on Norway spruce at College Park, Prince Georges County. (U. Md., Ent. Dept.).

A TUCKERELLID MITE (*Tuckerella ornata*) - FLORIDA - Severely infesting *Carissa grandiflora* at Marathon, Monroe County. (Dowling, Jan. 16).

INSECTS AFFECTING MAN AND ANIMALS

MOSQUITOES - TEXAS - Infestations in the Jefferson County area have been light. *Aedes sollicitans* noted around lights on warm evenings. *Culiseta inornata* has been active and is common in sheltered areas and around lights. *Culex* spp., mostly *C. salinarius*, more numerous than *A. sollicitans*. (Jefferson Co. Mosq. Control Comm.).

CATTLE GRUBS (*Hypoderma* spp.) - UTAH - Controls applied to cattle in Uintah, Daggett, Beaver and Duchesne Counties. (Knowlton, Bendixsen, Esplin, Smith). OKLAHOMA - Grub counts of *H. lineatum* averaged 4.5 per head in 42 yearling steers checked in Payne County. Light numbers reported from Mayes County, with counts of 3-10 per head noted in 40 percent of cattle checked in Bryan County and 2-15 per head in McCurtain County cattle. Checks in Marshall County averaged 16 per head on yearling cattle. (Okla. Coop. Sur.).

CATTLE LICE - UTAH - Controls applied in Uintah, Daggett, Millard, Carbon, Beaver and Duchesne Counties. Some Millard County cattle conspicuously infested. (Knowlton, Bendixsen, Esplin, Smith). NEW MEXICO - *Linognathus vituli* collected from calves at ranch near Crossroads, Lea County. (N. M. Coop. Rpt.). OKLAHOMA - Moderate to heavy populations of unspecified species present on cattle checked in McCurtain, Pushmataha, Marshall and Mayes Counties. (Okla. Coop. Sur.).

HOG LOUSE (*Haematopinus suis*) - OKLAHOMA - Moderate infestations reported from McCurtain and Bryan Counties. (Okla. Coop. Sur.).

HOUSEHOLD AND STRUCTURAL INSECTS

SUBTERRANEAN TERMITES (*Reticulitermes* spp.) - NORTH CAROLINA - Winged adults of *R. flavipes* received for identification from a Jones County extension agent. (Barnes, Jones). MARYLAND - Winged forms swarmed February 10 in basement of a building at Centreville, Queen Annes County. (U. Md., Ent. Dept.). PENNSYLVANIA - Swarming in homes at Lock Haven, Clinton County, on February 14. (Gesell).

BOXELDER BUG (*Leptocoris trivittatus*) - UTAH - Complaints of pest intering homes in Salt Lake County received at County Extension office throughout winter. (Knowlton, Parrish). MARYLAND - Caused a nuisance in house at Randallstown, Baltimore County. (U. Md., Ent. Dept.; Feb. 8). PENNSYLVANIA - Entering homes in many locations of State during December, January and February. (Pepper).

STORED-PRODUCT INSECTS

RICE WEEVIL (*Sitophilus oryzae*) - FLORIDA - Present on grains of corn at Carol City, Dade County. (Hickman).

MISCELLANEOUS INSECTS

MOTHS - ALABAMA - Showing up around night lights in Baldwin County. Some 10-15 observed flying to windows of residences each night, with only an occasional moth being noted further north in central counties and then only on evenings when late evening temperature is 50 to 60 degrees F. Species probably *Heliothis zea* and various cutworms. (Wilson et al.).

CORRECTION

CEIR 14(5):65 - Citrus Insect Situation in Florida - PURPLE SCALE (*Lepidosaphes beckii*) infested *76* percent of groves...

LIGHT TRAP COLLECTIONS

	Temperature F	Precipitation	Type of trap *	Agrotis ipsilon (black cutworm)	Carpocapsa pomonella (codling moth)	Chorizagrotis auxiliaris (army cutworm)	Estigmene acrea (salt-marsh caterpillar)	Faronta diffusa (wheat head armyworm)	Feltia subterranea (granulate cutworm)	Heliothis virescens (tobacco budworm)	Heliothis zea (bollworm, corn earworm)	Laphygma frugiperda (fall armyworm)	Loxostege commixtalis (alfalfa webworm)	Loxostege similalis (garden webworm)	Loxostege sticticalis (beet webworm)	Ostrinia nubilalis (European corn borer)	Peridroma saucia (variegated cutworm)	Prodenia ornithogalli (yellow-striped armyworm)	Protoparce quinquemaculata (tomato hornworm)	Protoparce sexta (tobacco hornworm)	Pseudaletia unipuncta (armyworm)	Spodoptera exigua (beet armyworm)	Trichoplusia ni (cabbage looper)	Major crop **
FLORIDA																								
Gainesville 2/10			BL						2															
Gainesville 2/14			BL						2												3			
GEORGIA																								
Tifton 1/23-29			BL							0	0								0	0				
Tifton 1/30-2/5			BL							0	0								0	0				
Tifton 2/6-12			BL							0	0								0	0				
SOUTH CAROLINA																								
Charleston 2/3-9	28-62	1.25"	BL	2			0		9	0	0	0					0	0	0	0	1		0	
TEXAS																								
Brownsville 2/1-6			4BL	40			8		171		8	192					144	152			120			
Brownsville 2/7-12			5BL	29			97		56		4	47		182			29	51	11		27			

* BL = blacklight; I = incandescent; MV = mercury vapor ; O = other

** alf. = alfalfa; beet = garden beet and/or sugar beet; cole = cole crops (crucifers); cott. = cotton; FC = field corn; grain = small grains; leg. = legumes (unspecified); lett. = lettuce; pean. = peanut; pepp. = pepper; pot. = potatoes; SC = sweet corn; sol. = solanaceous plants (unspecified); soy. = soybean; TC = truck crops (unspecified or mixed); tob. = tobacco; tom. = tomato.

SUMMARY OF INSECT CONDITIONS IN THE UNITED STATES - 1963

INTRODUCTION

The summary of insect conditions beginning in this issue and continuing in several succeeding issues of the Cooperative Economic Insect Report was compiled in Survey and Detection Operations from annual summaries that were submitted by State and Federal cooperators. A list of individuals who helped assemble the data will be published after the last section of the summary is published. Survey and Detection Operations is especially grateful to all those individuals who assisted with the preparation of the 1963 summary.

CROPS AND WEATHER - 1963 1/

The 1963 season brought conditions approaching the critical damage point to many parts of the Nation sometime during the growing period. However, relief seemed to come just in time and most crops attained good yields, although hay and pasture output was lowered. Fall-seeded grains got an early start and went into the winter in good shape in most areas. Severe winter weather took a heavy toll in the Central and Southern Plains areas. Spring rainfall was limited and a critically dry area developed in southwestern Kansas, southeastern Colorado, northeastern New Mexico, and the panhandle areas of Oklahoma and Texas. Rains in late May gave a boost to the areas surrounding this dry spot, but came too late to help most acreage in the driest area. Some damage from an unusually late frost about May 21 also lowered prospects for winter wheat in Nebraska and South Dakota. Other areas had generally favorable conditions and winter grains progressed rapidly. Harvest was one of the earliest on record.

Planting of spring crops was completed a week to ten days ahead of the seasonal pattern in most areas east of the Rocky Mountains because soils dried to desirable working condition early in the spring. Crops emerged and got off to a good start, but with less than normal rainfall over much of the Nation, shortages of topsoil moisture began to show up in May.

In the North Central States rainfall continued lighter than usual throughout June. Hay and pasture crops showed ill effects but there was only limited damage to the major row crops. July brought above normal moisture totals at the strategic ear-development stage for corn and boosted the growth of soybeans. Rainfall again dropped below normal in most of the area throughout the rest of the summer and fall. Corn, passing the critical period, continued on to high production levels, but soybeans were unable to reach the full potential of the earlier season growth. A much-delayed frost permitted full maturity of crops and harvest work proceeded rapidly in the dry fall months.

In the North Atlantic States, limited rainfall early in the season brought the threat of a recurrence of the 1962 drought. Timely rains relieved part of the region although eastern Pennsylvania, New Jersey and sections of New England remained dry, lowering crop production and pasture growth. A September frost also caused damage to late crops in parts of the North Atlantic States with some diversion of corn from grain to silage.

The most severe crop losses from lack of moisture occurred in an area centering in Virginia where below normal rainfall prevailed throughout the growing season. Hay and pasture crops were a near failure and corn was shifted from grain to silage and forage uses. Crop output was also reduced in Delaware and Maryland and parts of North Carolina. South Carolina, Georgia, and Florida were dry but received enough rainfall to bring most crops through to a good harvest.

1/ Crop Production, 1963 Annual Summary by States, Crop Reporting Board, Statistical Reporting Service, USDA, December 18, 1963.

Dryness in the fall held back the development of late season pastures. However, November rains have stimulated hope for fall-seeded grains and pasture crops to relieve the shortage of roughage for winter feeding.

Dry and hot weather in May and early June sapped available moisture and damaged some crops in the Gulf States. Mid-June rainfall brought relief to all except the earliest acreages, and crop production was generally favorable in the South Central States. A dry area, centered in Arkansas in the late summer and fall, lowered the potential for soybeans and other crops. Harvest weather was generally excellent in the South Central area except for some delays in cotton picking in northern Texas because defoliating frosts were late.

The western States entered the 1963 season with threatened shortages of irrigation water in areas depending on stream flow, but summer and fall rains brought above normal precipitation. Although slowed by continued cool weather, crops made good growth and a late frost permitted full development. In spite of the gloomy early season prospects, 1963 production was at high levels in most Western areas.

CEREAL AND FORAGE INSECTS

GRASSHOPPERS

Highlights:

GRASSHOPPERS were not a severe problem generally in 1963, but as the season progressed and dry weather persisted, severe infestations developed in local areas on rangeland throughout the Rocky Mountain area, and it became necessary to treat 498,147 acres in 8 States through cooperatively financed control programs. Grasshopper populations increased significantly during the year in Nevada, and 1963 was another year of serious grasshopper damage in Utah. Crop and range damage from grasshoppers was conservatively estimated to exceed $1,835,000 in Utah. In cropland areas of the Midwest, grasshoppers became a problem in parts of Illinois and Wisconsin and locally in several other States. Drought and near-drought conditions accentuated crop injury in some areas of Wisconsin, although cropping practices and adjacent vegetation influenced the extent of damage. Damage to alfalfa was severe in Green and Dane Counties. In Illinois, feeding damage was evident in many clover and alfalfa fields by late July, especially in the northwest district. An estimated 672,433 acres were treated in Illinois, mainly in the northwest, west and northeast districts. A map showing the results of the adult survey for 1963 was issued in CEIR 14(4).

Populations of MIGRATORY GRASSHOPPER (*Melanoplus sanguinipes*), PACKARD GRASSHOPPER (*M. packardii*), TWO-STRIPED GRASSHOPPER (*M. bivittatus*), RED-LEGGED GRASSHOPPER (*M. femurrubrum*) and CLEAR-WINGED GRASSHOPPER (*Camnula pellucida*) have subsided considerably during the past two seasons in *WASHINGTON*. The 1963 fall adult survey revealed only 22,000 acres of infested rangeland, occurring in Ferry and Stevens Counties. In *OREGON* , grasshoppers infested 455,900 acres during the year, of which 12,000 acres in Harney County were treated. The dominant species involved was clear-winged grasshopper. Grasshopper populations were generally low over most of Oregon during 1963. Grasshopper surveys during the spring in *IDAHO* indicated economic infestations covering 630,000 acres on private, State and Federal rangelands including National Forest areas. Adjacent croplands were frequently subject to possible invasion. Population counts ranged from a low of 20 grasshoppers per square yard to 400. The dominant species in Idaho included migratory grasshopper, two-striped grasshopper, Packard grasshopper and *Oedaleonotus enigma*. Controls were effectively used on 299,856 acres in the various Idaho counties as follows: Valley - 5,600; Gem - 500; Adams - 4,000; Lincoln - 78,468; Minidoka - 24,000; Blaine - 20,486;

Elmore - 42,000; Ada - 5,000; Boise - 37,972; Jerome - 33,000; Gooding - 48,830. Lands treated may be placed in these classifications with total acreages shown: U.S. Forest Service - 70,294; private range - 32,688; State lands - 14,520; Bureau of Land Management - 181,654; State Fish and Game Department - 700. Migratory grasshopper was the most numerous in 10 years in ALASKA. Only cool June temperatures saved a severe local outbreak.

High populations of grasshoppers were not reported to any great degree in MONTANA until late July, when some of the range species began to be noticed in northern areas. Mixed species, with only migratory grasshopper outstandingly predominant, occurred in a hit and miss arrangement over several sections of Phillips and Blaine Counties. Still later, some rather heavy populations of similar mixtures were reported in Glacier County, and in an area west of Great Falls, where rainfall was light and grass was in short supply, small spots of high concentrations were noted. These ran high to Aulocara elliotti and Drepanopterna femoratum. Probably the most outstanding feature about the grasshopper situation in Montana in 1963 was that grasshoppers were fewer and less widespread than any year since grasshopper observations have been made. The 1963 adult survey in Montana showed 5,787,000 acres of rangeland infested with economic numbers, the greatest acreage among the Western States. In WYOMING, several infestations of range grasshoppers occurred during the year. The number of acres of rangeland cooperatively treated are as follows: Goshen-Platte Counties - 93,061; Hot Springs County - 3,524; Niobrara County - 45,308. The 1963 grasshopper adult survey revealed 3 times more infested acreage in 1963 than was found in 1962. A total of 977,500 acres of rangeland was found infested with grasshoppers numbering over 7 per square yard.

The species of grasshoppers reported to be present in areas of COLORADO, where populations approached economic levels, include two-striped grasshopper, migratory grasshopper, red-legged grasshopper, DIFFERENTIAL GRASSHOPPER (Melanoplus differentialis), Aulocara elliotti, Amphitornus coloradus and clear-winged grasshopper. The early spring survey for grasshopper nymphs in Colorado indicated that control measures might be necessary in Huerfano, Archuleta, Boulder, Larimer and Dolores Counties. The nymphal population in Huerfano County disappeared following a hot, dry period and grass growth was not sufficient to maintain a grasshopper population. In Archuleta County, a small acreage was sprayed in the south part of the county in cooperation with a control program in New Mexico. Mountain meadow infestations in Archuleta County were scattered and no control program was undertaken. In the Boulder-Larimer County area, landowners decided not to form a pest district and, as the season developed, the grasshoppers in the area were reduced by natural causes 50 to 75 percent. In general, grasshopper populations were light throughout Colorado on rangeland and no buildup is expected in 1964. The loss of grass due to grasshoppers in 1963 was negligible and an estimated percentage value would not be realistic due to the nature of the growing season. Control of grasshoppers on wheat was undertaken in Dolores County in the spring and in Washington County in the fall. Light populations of grasshoppers could be found in the borders of corn fields, but the loss was minor.

Serious grasshopper damage occurred during 1963 in UTAH. The most extensive outbreaks occurred in Millard, Juab, Sanpete, San Juan, Sevier, Cache, Box Elder and Iron Counties, and quite generally along the "Wasatch Front." Crop and range damage from grasshoppers is conservatively estimated to exceed $1,835,000. Had it not been for the excellent range conditions due to the abundance of spring moisture, both crop and range damage would have been much more severe. The farmer, rancher, orchardist and home gardener control programs are estimated to have exceeded 240,000 acres sprayed for grasshopper control. In addition, an estimated 2,309 acres were sprayed in the Fish Lake National Forest area. Grasshoppers at the end of 1963 threatened damage to at least 425,250 acres of cropland and 538,300 acres of rangeland during 1964, a total of 963,550 acres.

Grasshopper populations increased significantly during 1963 in NEVADA, with most increases occurring in Elko, Eureka, Humboldt, Lander and Pershing Counties. Aulocara elliotti, clear-winged grasshopper, migratory grasshopper, Packard grasshopper and Oedaleonotus enigma were the dominant species. Approximately 4,000 acres of crested wheatgrass and adjacent rangeland were treated in Humboldt County in July. In several counties, varying amounts of damage was done to cultivated crops and some controls were applied. The 1963 adult grasshopper survey indicated infestations of 334,240 acres, or a three-fold increase over 1962, with these infestations located primarily in the above-listed counties. A medium infestation of a LONGHORN GRASSHOPPER (Idiostatus inermis) occurred on rangeland in southwestern Washoe County, Nevada, in August and a medium infestation of Idiostatus sp. occurred in Humboldt County in July and August.

The grasshopper situation in CALIFORNIA was of minor importance with very few instances of damage being reported. Populations over the State were comparatively light. The fungus, Entomophthora grylli, which was present and active during 1961-1962, was not evident to any extent in 1963. No large scale treatment was necessary, but local areas were treated. In February, egg beds in the Warner area of San Diego County showed evidence of heavy infestations which developed in April. During June, July and August, populations varied. Medium populations developed on seed alfalfa and clover in the Tehama-Red Bluff area of Tehama County, and infestations occurred on rangeland in Shasta, Humboldt, San Diego, Los Angeles, Plumas, Sierra, Fresno and Calaveras Counties. Although there were some problems, no large scale treatment was necessary.

Populations of clear-winged grasshopper built up in the Cuba area of Sandoval County, NEW MEXICO, where they damaged native grasses and plants. There was some voluntary treating done in this area. Many species of grasshoppers caused locally heavy damage to rangeland in areas of central, north central and northwest TEXAS, but they did not cause damage in widespread areas. In OKLAHOMA, grasshopper nymphs became active in early May and adults reached their peak activity during July. Populations became heavy in localized areas of south central, southwest and west central Oklahoma, but no general control programs were initiated. Limited damage was noted around margins of fall-sown wheat in the northwest. The dominant species were two-striped grasshopper, Packard grasshopper, differential grasshopper, Melanoplus occidentalis, Ageneotettix deorum and Amphitornus coloradus.

Grasshoppers continued scarce in western KANSAS during 1963, but populations built up in the eastern part of the State. Field margins of corn and alfalfa were damaged in local areas in the eastern portion of Kansas and insecticides were applied in some cases. The dominant species were red-legged grasshopper, migratory grasshopper and differential grasshopper. In MISSOURI, the grasshopper hatch was interrupted in May by an unseasonable cool period. This interruption extended the length of hatching time by at least two or three weeks. Noneconomic populations (5-10 per square yard in margins) were found in the southeast and south central areas. Light populations of 3-7 per square yard in fields and 11-20 per square yard in margins were found in the other areas of Missouri, except for moderate populations of 8-14 per square yard in fields and 21-40 per square yard in margins in the southwest and southeast areas. Heavy damage and high populations could be found in isolated fields and small areas throughout Missouri. The most damage was observed in the southwest area where drought conditions existed through the late summer and early fall. Grasshopper populations throughout the State were slightly lower in 1963 than in 1962. The species observed throughout the season, listed in order of their abundance, were red-legged grasshopper, migratory grasshopper, differential grasshopper and two-striped grasshopper.

Scattered cropland infestations of grasshoppers in the eastern half of NEBRASKA were about the same as in 1962. Areas involved were along the Missouri River Valley on the Iowa and South Dakota border west to Cherry County, the eastern half of the Platte River Valley and smaller areas in the southern part of Nebraska. Infestations have increased in size and severity in the panhandle in both crop and range lands. Moderate to threatening infestations occur in the Pine Ridge and Wild Cat Ridge areas. Egg counts for the most part indicate as high or higher populations than adult surveys indicated. In SOUTH DAKOTA, the spring grasshopper egg development survey conducted during the middle of April found eggs to generally be in the eye-spot stage of development. Eggs during this time were mainly in good condition with bee fly and carabid predators numerous in some egg concentrations. The grasshopper hatch in South Dakota started around May 15. Grasshopper nymphs in the first through third stages were found in Haakon and Custer Counties at this time. "Hopper" populations were considered noneconomic throughout South Dakota until around July 1 when some "hot spots" began to develop. Populations continued to increase throughout the summer, with the adult survey having several large areas in the threatening to severe category. The grasshopper egg survey compared favorably to the summer adult survey (high concentrations in the north central area), with egg parasites generally located in abundance throughout the State. In NORTH DAKOTA, rangeland grasshoppers were mostly light during 1963, but threatening numbers were found in some areas. Migratory grasshopper, Ageneotettix deorum and Aulocara elliotti were the main species involved. The dominant cropland species in North Dakota were two-striped grasshopper, red-legged grasshopper and migratory grasshopper. However, Packard grasshopper, clear-winged grasshopper, Melanoplus dawsoni and differential grasshopper were abundant in some areas. Infestations ranged from noneconomic to threatening. Most of North Dakota had light infestations, but isolated areas showed heavy to severe infestations. Parasitism of eggs in the north central and central areas by bee flies and carabids averaged 6 percent. Considerable mortality of adults due to the fungus, Entomophthora grylli, was observed in the southwest. Considering the entire State, grasshoppers did not pose a serious problem in North Dakota this past season.

After a cool spring in MINNESOTA, weather conditions turned warm and dry from June to the middle of July. In eastern Minnesota, little or no rain fell for six weeks. This was ideal for grasshopper egg hatch and nymphal development. Areas with threatening or high infestations remained much the same as in 1962. The only area showing an appreciable grasshopper population increase was in parts of Kandiyohi, Meeker and Wright Counties in the central district. Fields with threatening to severe infestations were most numerous in central and east central counties and, to a lesser extent, in southeast, west central and northwest counties. In all counties having economic grasshopper populations, infestations continued to be scattered and localized. Alfalfa was the principal habitat, but roadsides, field margins and soil bank land were important in some areas. Red-legged grasshopper was the dominant species in Minnesota. An increase of differential grasshopper was noted throughout the southern half of the State. This species was of economic importance in roadsides and field infestations in the west central district. Generally, the acreage treated for grasshoppers was very limited. There was a marked decrease in migratory grasshopper populations, and clear-winged grasshopper was extremely rare in 1963. Two-striped grasshopper was dominant in Kittson and Marshall Counties, but elsewhere it represented only a small percentage of the grasshopper population. Packard grasshopper was of concern only in the light-soil areas of the State; populations were down. In late August and September, fungus disease began to show up. All species of grasshoppers were affected to some extent, but differential grasshopper seemed most prone. Fields differed greatly as to the incidence of disease.

In WISCONSIN, the more outstanding injury to crops by grasshoppers occurred in areas containing the highest number of grasshoppers, although equally as severe damage took place in areas with lower populations. Drought and near-drought conditions accentuated crop injury in some areas, although cropping practices and adjacent vegetation influenced the extent of damage. Migrations of grasshoppers were minimal and the majority of feeding occurred on alfalfa, grasses, corn and soybeans. Fall rains stimulated growth and late-season damage was not consequential. The grasshopper most commonly present in 1963 in Wisconsin was red-legged grasshopper, although differential grasshopper comprised better than 50 percent of the grasshopper population in certain southern areas of the State.

Differential grasshopper was most frequently encountered in corn fields, and CAROLINA GRASSHOPPER (Dissosteira carolina) was most frequent species found feeding in tobacco and soybean fields. Red-legged grasshopper eggs began hatching the first week of June in central Wisconsin, about 5 days earlier than in 1962. A delayed hatch occurred near the end of July as populations of fourth and fifth instars were commonly interspersed with first and second instars. Females containing eggs were observed as late as November 19. Melanoplus confusus eggs hatched on April 20, 10 days earlier than in 1962. Maturation occurred by the second week of June. The first mature overwintering Pardalophora apiculata was observed on April 26 in Wisconsin, 5 days earlier than in 1962. First instars of migratory grasshopper appeared the second week of May, and first instars of two-striped grasshopper appeared the second week of May. Populations of latter species became abundant enough in the first week of July to necessitate treatment in Adams and Waushara Counties. Eggs of differential grasshopper hatched by the first week of June. In summary, grasshoppers, particularly red-legged grasshopper, caused severe damage to alfalfa in Green and Dane Counties.

The grasshopper parasite and predator study that was conducted in Wisconsin indicated that in general black blister beetle (Epicauta pennsylvanica) activity was most pronounced in the southern 3 tiers of counties and that there was a correlation between high populations of parasites and predators and high as well as low numbers of grasshoppers. In areas where grasshoppers were scarce, these biological agents were in many instances responsible, arising from the preceding year's population. In instances where grasshopper populations are presently high, it can be speculated that a decrease in the succeeding year's grasshopper picture will occur. It would appear, from the results of fall observations and experience during the season, that populations of grasshoppers were higher and damage more acute in a few areas than in previous years. A general increase throughout Wisconsin was evidenced although the areas which perennially experience grasshopper problems changed little. Mild temperatures and light rainfall in the fall offered ideal conditions for egg laying, although the high numbers of biological agents should take their toll.

The dominant species of grasshoppers in ILLINOIS were red-legged grasshopper, differential grasshopper and migratory grasshopper. Damage to pastures and marginal rows of soybeans began to show up in early July, mainly in the west and west-southwest districts. By late July, feeding damage was evident in many clover and alfalfa fields, especially in the northwest district. Some fields had 50 to 60 grasshoppers per square yard. An estimated 672,433 acres were treated, mainly in the northwest, west and northeast districts. The annual adult survey showed moderate populations in most of the northwest district, along with parts of the northeast, west, central and east districts which had light infestations. The remainder of the State had noneconomic populations except for a small light infestation in the southeast district. Some grasshopper damage occurred in IOWA during 1963. Counts during early July ranged 5-30 per square year in alfalfa, red clover and pastures and 10-50 per square yard in fencerows in the southern part of the State. The adult survey showed populations to be mostly light or noneconomic, with a few western and northeastern areas having moderate populations.

A late summer survey in MICHIGAN showed that red-legged grasshopper continued its downward trend. It is predominantly found on the heavier soils of northern Lower Michigan and the Upper Peninsula . Migratory grasshopper, which is found predominantly on the lighter soils of northern Lower Michigan and the Upper Peninsula, continued a low population trend of former years. Differential grasshopper was relatively low in number and occurred in southern counties of the Lower Peninsula of Michigan. In OHIO, red-legged grasshopper and differential grasshopper began building up in numbers during August, reached their peak in middle September and decreased considerably in early November. Heaviest populations in the State were observed in Pickaway, Ross and Fayette Counties in the central and south central parts of the State. In Ross County, Ohio, soybean plants were 35 percent defoliated and field corn 45 percent defoliated along the outer rows of a few fields. Counts averaged 15-20 grasshoppers per square yard along the grassy borders of roadsides. Differential grasshopper caused heavy feeding injury to a field of soybeans in Sussex County, DELAWARE, and *Melanoplus* spp. nymphs were very numerous in and near several hay fields in Anne Arundel and Queen Annes Counties, MARYLAND.

MORMON CIRCKET (*Anabrus simplex*) remains at a very low level throughout the historically infested areas of WASHINGTON; only an occasional solitary cricket was collected. Surveys during the spring in IDAHO disclosed one area along the Adams-Valley-Gem County line southwest of Cascade. In this area, Mormon cricket averaged 7-10 per square yard over 10,000 acres. The pest was interspersed with various species of grasshoppers. Control work was effected by the use of spray, since grasshoppers were also involved. A total of 10,100 acres was treated in the following Idaho counties: Valley - 5,600; Gem - 500; Adams - 4,000. This is the same area reported treated for grasshoppers in the State. A second economic Mormon cricket area of approximately 600 acres located between Bennington and Montpelier in Bear Lake County was effectively treated by ranchers. Mormon cricket populations were generally low in previously infested areas of OREGON due to inclement weather during the spring and early summer. However, infestations increased slightly in 1963 in NEVADA. Surveys showed that 33,000 acres are infested in Elko, Eureka, Humboldt, Lander, Pershing and Washoe Counties. In UTAH, baiting for control was applied to 2,000 acres in San Juan County, 800 acres in Tooele County and 2,000 acres in the south Kanosh area of Millard County. The Mormon cricket had been expected to be a threat to large acreages of rangelands in the Bear Top Mountain area of Daggett County, Utah, in 1963. Fortunately, numbers turned out to be too light to justify a major control program in the area.

The Leafhopper Vectors of Corn Stunt and Some Related Species in Southern United States (Homoptera: Cicadellidae).

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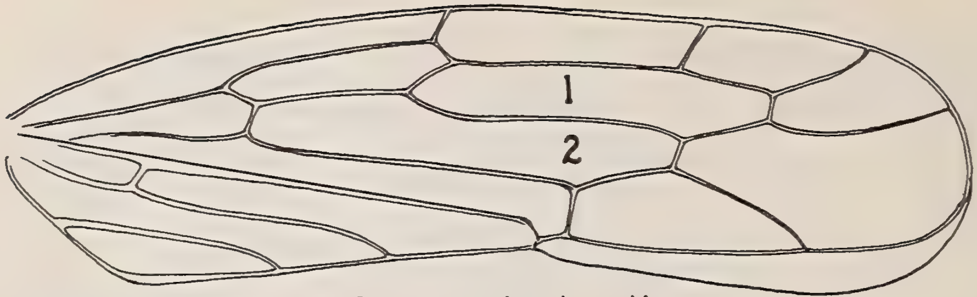
The known vectors of corn stunt are two species of leafhoppers, *Dalbulus maidis* (DeLong & Wolcott) and *Dalbulus elimatus* (Ball). *D. maidis* is the more widely distributed species and will probably prove to be the more important vector at least in the United States. Both species were formerly in the genus *Baldulus* and much of the published literature treats them with this generic name.

D. maidis. The basic color is some shade of yellow or greenish-yellow with the only distinctive markings occurring as black spots on the crown, one above each ocellus. The forewings are yellowish subhyaline with the veins lighter. The length is about 4 mm. Distributional records in the U. S.: Arizona (Patagonia, Sedona, Tucson); Arkansas (Gould); California (Alhambra, Colton, Temple); Florida (Sanford); Missouri (Joplin); North Carolina (Raleigh); and Texas (McAllen, Nueces County, Brown County, Richland Springs). It is also found in the West Indies, Central and South America.

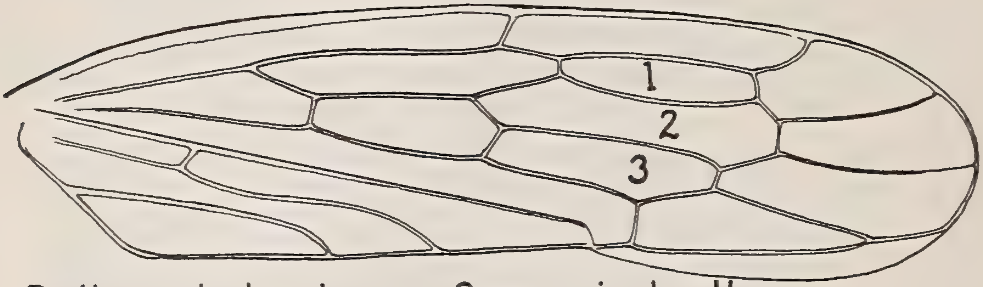
D. elimatus. The basic color is pale brown or brownish-yellow with the only distinctive markings occurring as black spots on the crown, one above and one below each ocellus. The pronotum frequently has five more or less well-defined pale longitudinal stripes. The forewings are pale brown subhyaline with the veins lighter. The length is about 4 mm. Distributional records in the U. S.: New Mexico (Mesilla Park). It is also found abundantly in Mexico.

The following key and illustrations will provide a means for the field worker to separate *Dalbulus maidis* (Delong & Wolcott) and *Dalbulus elimatus* (Ball) from *some* of the more common similar species. All of the characters used in the key can be seen with an ordinary hand lens. Large green, black, dark brown, or more elaborately patterened leafhoppers can be automatically eliminated before using the key. All of the species included in the key are 4 mm. or less in length and are basically yellow, yellowish-green, or light brown in color.

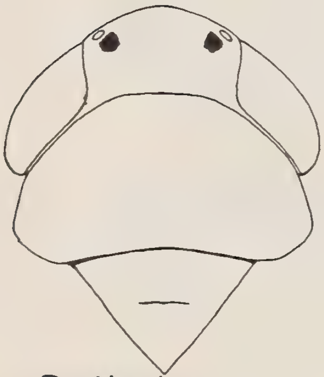
1. Forewing with three preapical cells; markings of crown consisting of four dark spots along anterior margin 2
   Forewing with two preapical cells; markings of crown, when present, consisting of two dark spots along anterior margin 4
2. All spots on crown of about equal size or those at apex slightly larger than those near each ocellus .... *Graminella nigrifrons* (Forbes)
   All spots on crown not of equal size, those at apex smaller than those near each ocellus 3
3. With a distinct brown band across hind margin of pronotum; spots near each ocellus much larger than spots at apex, no additional markings on crown .... *Graminella villicus* (Crumb)
   Without a band of any sort across hind margin of pronotum; spots near each ocellus slightly larger than spots at apex, additional markings on crown .... *Deltocephalus sonorus* Ball
4. Length of crown uniform, without dark spots on anterior margin .... *Balclutha* spp.
   Length of crown greater at middle than next to eye, with dark spots on anterior margin 5
5. With a dark spot above and below each ocellus .... *Dalbulus elimatus* (Ball)
   With a dark spot only above each ocellus .... *Dalbulus maidis* (DeLong & Wolcott)



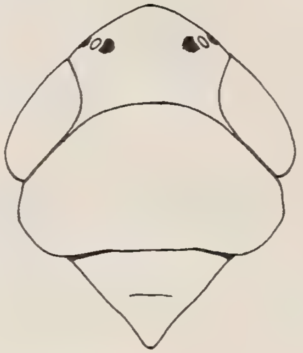
Dalbulus type - 2 preapical cells



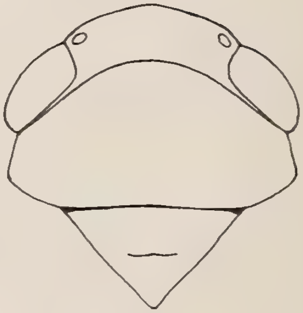
Deltocephalus type - 3 preapical cells



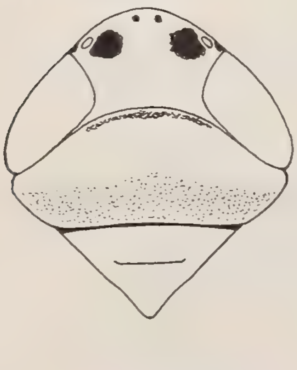
Dalbulus
maidis



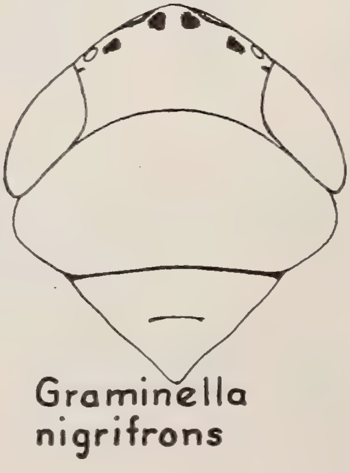
Dalbulus
elimatus



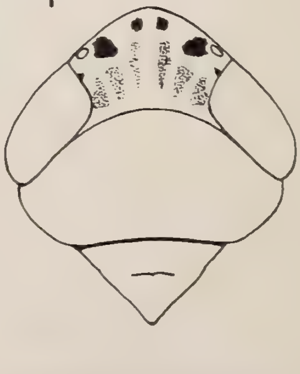
Balclutha
sp.



Graminella
villicus



Graminella
nigrifrons



Deltocephalus
sonorus

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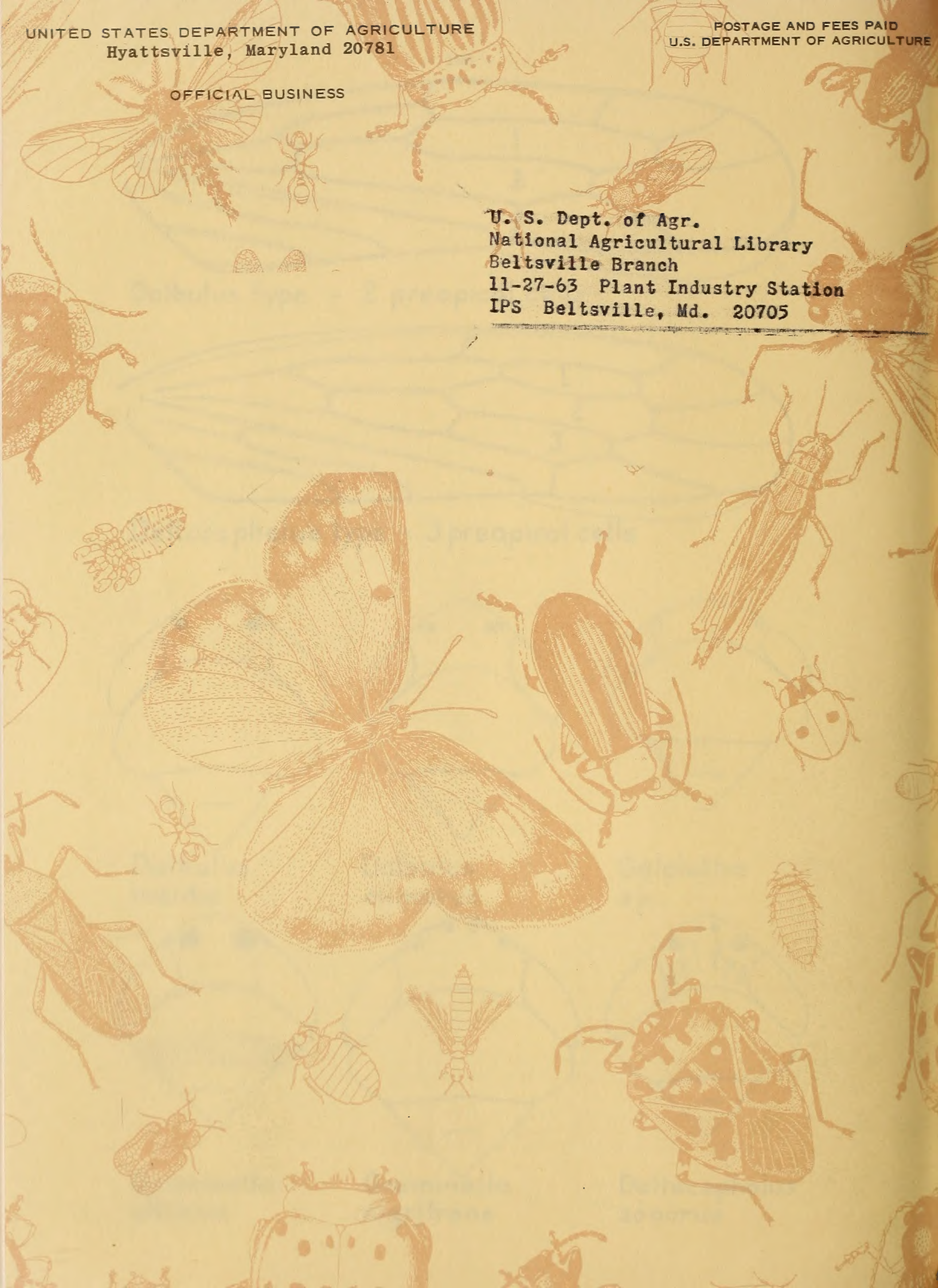

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